Coordinated Research Project on the Development of a Database for Prompt Neutron Activation Analysis*

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Neutron-induced Prompt Gamma-ray Activation Analysis (PGAA) is a non-destructive radioanalytical method capable of rapid or in situ simultaneous multi-element analysis involving the entire periodic table from hydrogen to uranium. Typically twenty or more elements can be identified in a single sample. Both elemental concentrations and isotopic ratios can be determined.

The availability of large Compton-suppressed Ge detectors and high-quality guided (or filtered) thermal and cold neutron beams at high and medium flux reactors has greatly facilitated the development of PGAA in recent years. PGAA has been widely applied in materials science, chemistry, geology, mining, archaeology, environment, food analysis, medicine and other areas.

Inaccuracy and incompleteness of the data used in this method are a significant handicap to the qualitative and quantitative analysis of complicated gamma-ray spectra. Accurate and complete neutron capture gamma-ray energy and intensity data are also important in other fields like shielding calculations and astrophysics. Only limited data are available for cold neutron capture calculations and k_0 determination, so a convenient standardization method for PGAA needs to be established. These deficiencies were recognized during the meeting on the Coordination of the Nuclear Structure and Decay Data Evaluator's Network in Budapest, 14-18 October 1996. An IAEA Coordinated Research Project on the Development of a Database for Prompt Gamma-ray Activation Analysis was started in 1999.

At the first meeting of the IAEA CRP in Vienna it was determined that the PGAA database would be developed as follows. Isotopic cold and thermal neutron-capture gamma-ray data would be evaluated in ENSDF format by the LBNL and Beijing groups. Best values for gamma-ray yields, per 100 neutron captures, would be determined. Elemental cold and thermal neutron capture data, measured at the Budapest Reactor and elsewhere, will then be combined with the Isotopic data by the LBNL and Budapest group to obtain a set of recommended values for prompt gamma-ray energies, intensities, k_0 factors, neutron cross sections, g-factors and other relevant information.

Other members of the CRP will be involved in benchmark tests of the database at a variety of neutron facilities. The IAEA CRP has been funded for three years ending in 2002.

Footnotes and References

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